The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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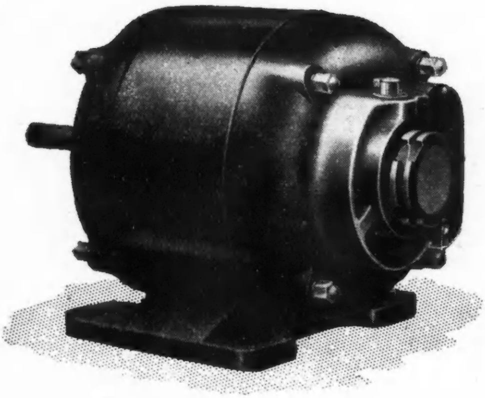

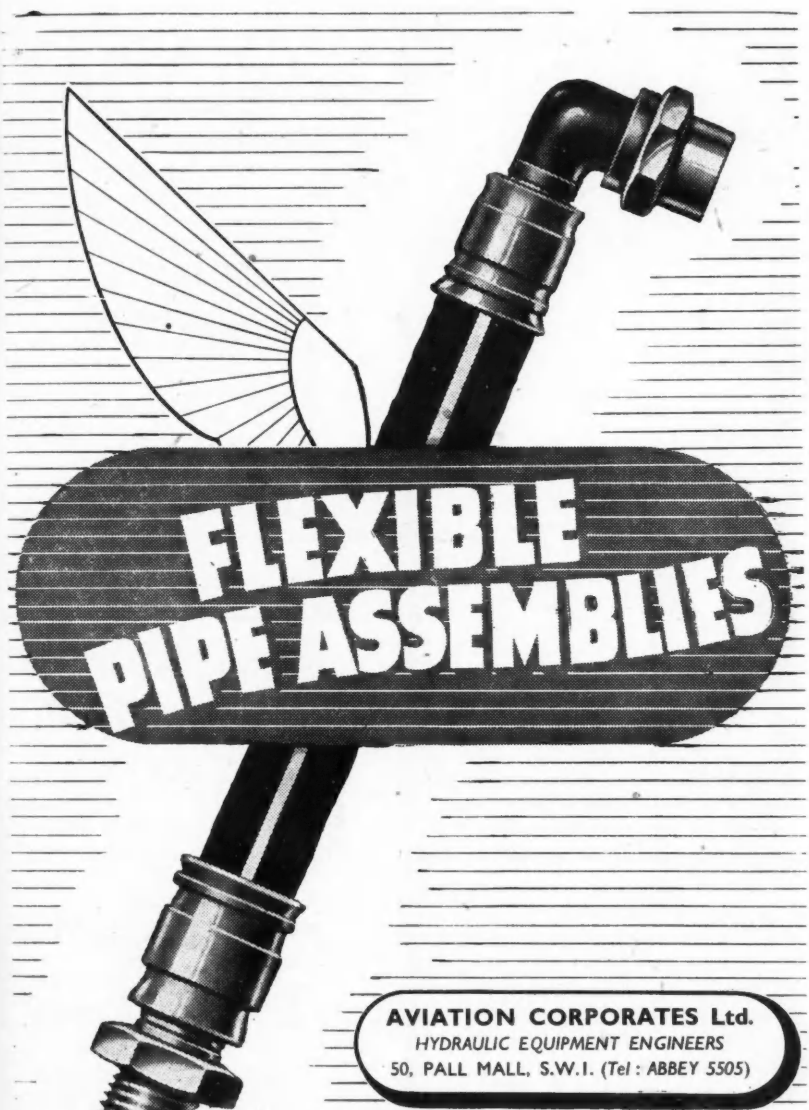

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Chemical Engineer

MR. F. A. GREENE, in his recent presidential address to the Institution of Chemical Engineers, wisely called attention to the growing importance of the chemical engineer. Engineers were once divided into two simple categories, civil and military, but the increasing complications of life have caused these two classes to be subdivided under many heads. Why is the term "engineer" so persistently applied? Essentially it is a useful description of anyone who is engaged in applied physics. On consulting the dictionary we find that an engineer is defined in several ways, among which is included "one who is trained in the scientific principles of mathematics, physics, and mechanics underlying the design, construction, and use of all kinds of machine." In the same dictionary a machine is described as "an apparatus consisting of several parts some of which move in a specific manner and direction, and each of which is adapted for a special function, designed to produce a desired effect." It would appear therefore that in the modern definition of the engineer the word "machine" should not be used or should be supplemented by the words "or industrial plant." Whatever view we take of the ubiquitous term "engineer" as used to define a person engaged on almost any type of specialised work, it will be seen that we must continually invent new kinds of engineer as progress is made in technology. It is thus by no means prematurely that the term "chemical engineer" has come into vogue.

We should, however, first satisfy ourselves what is meant by chemical engineering. On this point Mr. Greene was positive. He quoted the definition approved by the Council of the Institution of Chemical Engineers at its inception, namely: "a chemical engineer is a professional man experienced in the design, construction, and operation of plant and works in which matter undergoes a change of state and composition," and he further emphasised Dr. Underwood's amplification of this in which it is pointed out that skill in operation can be acquired by a good process-hand or foreman and the construction of a plant can be safely left to the mechanical engineer, but that "it is in the *design* that knowledge of the fundamental principles of chemical engineering is needed." Thus the opinion of those who are well qualified to judge appears to be that while the chemical engineer should have

On Other Pages

a knowledge of operation and of construction, he must above all have a knowledge of the design of certain plant in which matter undergoes a change of state *and* composition.

Some are disposed to question this definition as regards operation. It is quite true that the operation of a plant under normal conditions can be undertaken by an intelligent workman. It is the engineer's job, however, to deal with operation under abnormal conditions also, and it is when something unexpected goes wrong that the chemical engineer comes into his own. We admit that very often a knowledge of design is required to rectify process difficulties, but we should be disposed to give the title of chemical engineer also to a good operating engineer who was not perhaps particularly strong on the design side. One very important function of the chemical engineer must be the development of new plant and processes, and in this a knowledge of operation is often just as important as a knowledge of design.

It is interesting to reflect that as industries have arisen during the last 150 years or so, so engineers capable of developing them have been called for and found. The coal industry was perhaps the first in the industrial age and the mining engineer was evolved. The gas industry was an early starter and the gas engineer is still with us. Mechanical engineering was also early developed and the mechanical engineer is a well-known member of society. And so on, with other branches of industry ; as each new industry arrived, there was an urgent call for specialists who could design, manufacture, and operate. We are now in the chemical age and the need for chemical engineers is urgent. Mr. Greene has himself pointed out, in a recent letter to *The Times*, that whereas the American universities are able to provide for industry every year some 2000 or 3000 highly trained graduates in chemical engineering, of whom no fewer than 400 or 500 are provided with adequate financial support for post-graduate work on industrial problems, in this country the annual number is certainly not more than 50, and few of these have opportunities for post-graduate work.

Chemical engineering is of special value in *accelerating* the application of the results of pure scientific research to industrial production. By means of the chemical engineer's detailed analysis of plant performance, new productive installations can be designed without the slow, costly, and sometimes financially disastrous method of trial and error. That the facilities existing before the war were hopelessly inadequate is hardly yet fully recognised. The problem of securing the necessary share of world trade is now urgent ; yet the extent of the lead acquired by other countries in the training of technical personnel is still not sufficiently realised. The question whether the planning of technological education should be regional or central would properly follow a correct appreciation of the extent of the problem.

This brings us to the question of education. It would be foolish to attempt to discuss the education of the chemical engineer in a few lines when Mr. Greene and many others have been discussing this subject for years at great length. The president's own views will be found in his address published in our columns on April 22. We have just one comment to make upon this. How far is it desirable for our universities to attempt to teach specialised branches of engineering which embrace many subjects ? Our definition of an engineer shows that he is essentially a specialist in applied physics on a works scale. For many branches of engineering what is really essential is to teach physics and sufficient chemistry during the greater part of the training of the engineer, allowing specialisation only in the last year. The universities should not try to turn out finished products for industry. They should be regarded as the manufacturers of industrial human intermediates. Mr. Greene himself said, " the resources of educational authorities are definitely limited—those of the industrial world are almost limitless." In spite of the hopeful things that have been said, we do not believe that any student from a university, even though he should have a Ph.D. or M.Sc. degree in a particuar subject, is of much use in industry until he has spent from three to five years under industrial conditions ; at least he is not of very much use on the practical side. It should be regarded as a function of industry itself to convert this intermediate product, coming from the universities and schools, into the finished product required in the works.

NOTES AND COMMENTS

Penicillin Production

IN the absence of statistics for British penicillin production, it is difficult to assess just how much greater is the production in America than in our own factories. This week, official figures for America were given by Dr. Robert Coghill, of the U.S. Department of Agriculture. At the moment $1\frac{3}{4}$ lb. is being turned out per day. This amount represents an increase of 100 times, an increase achieved in a period of only ten months. The target for the immediate future is 9 lb. a day. Increased production has meant a considerable fall in price; the first price quoted for penicillin was equivalent to £37,500 a lb., whereas the latest figure given is £8100. For some reason the Ministry of Supply seems loath to give the relevant statistics for British production. The Ministry refused to give the names of the companies making the drug upon which countless people pin their hopes, and it was left to the firms concerned to reveal themselves by means of a joint letter to the Press. In the absence of official information the public began to fear the worst, M.P.s started to ask whether another monopoly had come into existence, whether it was possible that some firms were being "locked out" from a hypothetical production ring. The Minister of Supply, preferring categorical denial to informative statement, did little to dispose of rumours and allegations which, we trust, were ill-founded.

Government Responsibility

THE only hard fact given by the Government of recent weeks has been the statement of Mr. Attlee that 500,000,000 Oxford units have been made available for chemical research. Taking a gram of penicillin as about 200,000 units, that amount is equal to $2\frac{1}{2}$ kg., or some 5 lb. of penicillin powder. Calculation is made difficult because penicillin is not a preparation of uniform strength; for instance, the authorities of the U.S. Pharmacopœia in their draft monograph on the drug suggest that the sodium salt of penicillin, obtainable in small quantities from at least three American makers, should be taken as the international standard, with a potency of 1,650,000 Oxford units per gram—which is eight times stronger than the original commercial preparations. We do seriously doubt, however, whether British production is one-third that of America. Mr. Peat, for the Ministry of Supply, has stated that penicillin is manufactured only under Government auspices. Hence the responsibility for getting it into production rests primarily with the Government. Is it just possible that the Government prefers to rely on American sources of Lease-Lend supply rather than to encourage and stimulate British firms to raise output to the utmost? We are promised a production push, though whether that is to take place in American, Canadian, or British factories is not quite clear. The authorities like to justify the extreme secrecy surrounding penicillin by saying that the drug is to be ranked with the "secret weapons." Let them realise that we shall expect to suffer no shortage of this near-secret weapon by the time the Second Front opens, for to many a Service man penicillin will come to mean an extra chance of life.

100-Octane

THE phrase about an army marching on its stomach is now out of date. We have to think in terms of an air force flying on high-octane fuel.. One of the best examples of the importance of the special skill which the chemist has contributed to the war effort is provided by 100-octane fuel, about which the U.S. Petroleum Administrator for War has just released details. Allied production of this aviation spirit is now more than 400,000 barrels a day—enough to send 10,000 planes over Berlin every day of the year, if we wanted to use it that way! Before the war, aircraft had to rely mainly on 87-octane, the pre-war American output of 100-octane being only about 5000 barrels a day, though by October, 1941, that figure had risen to 40,000 barrels. To prepare this fuel it is necessary to start with a base stock superior to the best pre-war motor spirit, and to this must be added tetraethyl lead and special blending agents obtained from petroleum gases. The research chemist, the chemical engineer, and the control chemist between them have had to solve many production problems; 14 catalytic cracking plants and 72

smaller units had to be converted from motor spirit production to turning out 100-octane ingredients, and polymer plants modified to turn out co-dimer. The efficiency of the production process has, we are told, been greatly improved, so that to-day, from a single barrel of crude petroleum, 4.2 gallons of 100-octane can be obtained instead of the former yield of 0.21 gallons.

The Variety of Glass

MODERN glass technology has an undoubted fascination for the layman. He probably enjoys the mysterious paradox of a material that can provide him with brittle wine glasses, with spectacle and binocular lenses, with heat-resistant pie-dishes and ovens, with the foam glass substitute for cork, and with glossy textile materials. The key to the mystery is, of course, that there is not one compound called glass but thousands. According to an interesting article in *Ceramic Age* (Feb., 1944, p. 59), the Corning Glass Works of New York State have over 27,000 different formulæ for glass-making on their files. From these are made about 400 different kinds of glass, suitable for a wide variety of special uses. Glass which will stand temperatures of over 1000°C. and which is more corrosion-resistant than stainless steel is there, ready to speed the production of aviation petrol. It should not be forgotten, however, that similar industrial glass piping is available in Britain, from Jobling's of Sunderland, for instance.

Resisting High Temperatures

MOREOVER, as foam glass and as fibre, glass is an excellent heat insulator. Fibrous glass is finding another important use in fractionating columns, as employed in the distillation of alcohol; we would refer our readers to the article on this particular usage published in *Chem. Met. Eng.*, Feb., 1944, p. 145. Some glasses are made from the oxides of rare metals, without any silica. Others, for instance Corning's No. 790, the glass which is resistant to temperatures of 1000°C., are mainly silica. One of the Corning principles is that with glass "it is not what you put into it but what you take out that is important." For making No. 790 the technique is to start with a soft borosilicate glass, then leach out nearly everything except the silica with strong hydrochloric acid. The highly porous and absorbent residue is re-heated under pressure and the final product is the hard, heat-resistant glass now being used on a large scale.

LETTER TO THE EDITOR

Scientific Information

SIR,—In your issue of April 29, Dr. Bradford complains of obscurity in my letter, kindly reproduced in your issue of April 22, concerning the availability of scientific information. I think Dr. Bradford underrates the intelligence of your readers, but with your permission I will supplement my previous remarks to some extent.

In my experience, as in that of all who have compiled lists of references in answer to inquiries by specialists on scientific and technical subjects, the provision of a "central index" is only a first step in the procedure. If the index is a heterogeneous collection of the products of a series of autonomous organisations, many of them competitive, in a variety of countries, the first step may even be backwards. In any case, the task involves skilled selection and considerable labour, both technical and clerical. In my original letter, I assumed that your readers would recognise this factor, and that they might conclude that, in return for some alleged help by the British Society for International Bibliography in "creating the nucleus" of "the forty million bibliographical references in the Science Library," the latter institution provided the necessary staff to supply the information desired through the agency of the former. Whereas the actual facts are that the society had no hand whatever in "creating" the library's collection of references, which mostly consist of collections of abstract journals, cumulated indexes to periodicals, and similar matter published long before the society existed, and in any case acquired in the normal way by the library and obtainable by any other library that wants them.

As the British Society for International Bibliography has no staff to deal with the supply of information, and such staff as the Central Agricultural and Scientific Bibliography once possessed has ceased to operate in that capacity, it is a little difficult to discover what staff to supply information Dr. Bradford had in mind when he talked about "our service" being "developed to meet any demand." Possibly the staff will be "created" in the same way as the Science Library's collection of references was; but the use of the term "developed" implies something already in existence.—Yours faithfully,

E. LANCASTER-JONES,
Science Library, Science Museum.

[This correspondence is now closed.—ED.]

FUEL ECONOMY IN THE CHEMICAL INDUSTRY

Fuel Efficiency Lectures

X.—Automatic Heat Control

by L. S. YOXALL

MOST manufacturing plants and processes involve the use of heat to effect chemical and physical changes. It is just as wasteful to use too little heat as it is to use too much. Both, in the final analysis, result in an inferior product or one which, to a greater or lesser degree, deviates from specification. It is especially wasteful if the product has to be re-treated or scrapped. The attempt is here made to outline some of the basic conditions for successful automatic heat control. The criterion of fuel economy is to use just that quantity of heat which is necessary to effect the particular chemical or physical change desired.

Automatic controllers, correctly designed and applied, by maintaining accurately the conditions for which they are installed, approach very closely to this ideal of fuel economy. Nevertheless, it must not be forgotten that their primary purpose is to ensure a uniform and high-quality product. For the automatic control of industrial processes there are available, to-day, three basic types of control system: (*a*) Controllers employing on-off action; (*b*) Controllers producing a proportional action; and (*c*) Controllers utilising proportional action with throttling range reset.

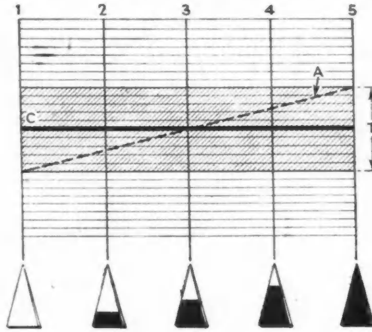
On-Off Action

On-off controllers are, as their name implies, controllers which in operation cause the valve to be either fully open or completely closed. They are used on applications which have a large favourable capacity combined with a relatively low demand, and where the period of time between the admission of the supply and its absorption into the process is comparatively short. Many chemical engineers consider that throttling action is an improvement over on-off action. Between the two there can be no general comparison, as their use depends on process reactions. Some conditions demand one type of valve reaction, some the other. It would be poor engineering practice to use the principles of throttling action control on a process that can be controlled by on-off action. Statistics show that approximately 65 per cent. of all industrial control applications are best handled with this type of control system.

Proportional Action

The air-pilot-operated controller giving a throttling action in its simplest form is the proportional controller. Fig. 1 illustrates graphically the principle of proportional action. The line "C" represents the desired control point in the centre of the throttling zone "T" and line "A" represents the position of the measuring element within the throttling zone for various controlled valve openings from fully open at 1 to fully closed at 5.

If the process conditions are such that a half-open position of the valve balances the demand,



V-port valve-openings.

Fig. 1.

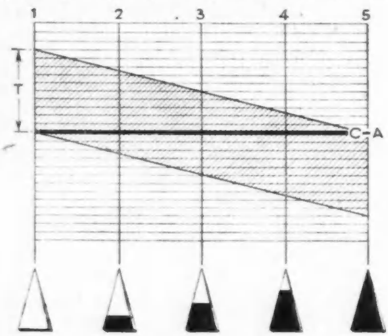
then this position on line "A" coincides with line "C" at 3 and control will be at the desired point. If, however, the process conditions change, the demand must change, and the valve must assume a different position of opening to balance the new demand. The point on line "A" representing the new position of valve-opening, is now the control point and as long as the new conditions remain constant the valve-opening will remain at the new position. The process may require any position of valve-opening between 1 and 5, and may balance out so that the actual control point may be anywhere within the throttling zone. It follows therefore, that accurate control with the proportional controller is possible and practical only on those process applications which permit the use of a relatively narrow throttling zone. Statistics show that about 10 per cent. of all industrial process applications fall within this class.

Proportional-Reset Controllers

It has already been shown in connection with proportional controllers that the control is set to a zone of control and not to a fixed point. This zone represents the throttling range and the actual control may be anywhere within it. With the proportional-reset controllers, the control is set to a fixed point and the throttling

range moves about it in order to establish a change in the valve opening.

Fig. 2 illustrates the principle of proportional-reset action. Again we have T for the throttling range, C for the desired control point and A for the actual control point; but in this case C and A are identical, so we combine them to C–A. If we again take a process condition such that a half-open position of the valve balances the demand, the control point will be in the centre of the throttling range at 3. Now, if the demand changes, requiring the valve to be one-quarter open, the throttling range will change to a position at 4 and the control point will remain at C. In comparing Figs. 1 and 2, it is clear that the same relation exists in both between T, the throttling range, and A, the actual control point. This relation must be the same to produce the valve openings required by the process demand.



V-port valve-openings.

Fig. 2.

Statistics show that about 25 per cent. of all industrial process applications require proportional-reset action.

One of the most important details in any throttling-control problem, and one which is often overlooked, is the controlled valve. A throttling-controlled valve is under constant automatic control and is, therefore, more than a valve—it is an adjustable orifice or opening, adjusted by the reactions of the control instrument in accordance with the process demands. It is an integral part of the complete control equipment, and to work properly it must have various characteristics not found in ordinary valves. The degree of accuracy of control will be materially affected by a controlled valve lacking these characteristics.

When the process requires throttling valve action, the most important flow characteristic of the controlled valve is that the valve must produce equal percentage change in flow for equal increments of lift (*see* Fig. 3). This statement should be entirely clear when it is understood that in any control problem the supply of the controlled medium must equal the demand; a 10 per cent. change in demand requires a 10 per cent. change in supply to establish equilibrium. At some particular control point the same percentage change in demand will always result in the same deviation-potential

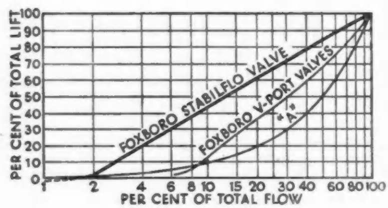


Fig. 3.

(force tending to cause the process to deviate from the control point). The same deviation-potential will always cause a properly designed control instrument to effect the same change in valve lift. Therefore, since an equal percentage change in demand must produce an equal percentage change in supply, it is obvious that equal increments of lift must produce equal percentage changes in flow.

It is not uncommon to request that there be very little pressure-drop through the controlled valve. The drop through a controlled valve is not a matter of choice; its magnitude is determined by the conditions of the process. In every control problem there is a certain variable pressure difference which affords a means of control. If the greater percentage of this pressure difference occurs, or can be caused to occur, across the controlled valve, an excellent means is provided for obtaining automatic control. If the controlled valve works out at as much as three-fourths of the size of the line, control may prove difficult because of the fact that the small line has caused excessive drop through the line and fittings. Pressure drop is desirable in the valve; it is highly undesirable in the line; the proper-sized valve having been computed, the line should be twice the diameter of the valve.

Practical Application of Controllers

Every control problem—manual or automatic—is essentially one of controlling rate of flow, whether it is B.Th.U.'s in temperature control; gas or liquid in pressure and flow control; or liquid in level control. Furthermore, while a temperature controller is the direct means by which heat is regulated, it must be borne well in mind that a pressure, flow, or level controller may, by its particular application conditions, be the means of adding or taking away B.Th.U.'s from a particular process. Therefore, any discussion on heat control for any plant or process would not be complete unless all control instruments, irrespective of their particular physical functions, were taken into consideration.

All applications of control, whether for temperature, pressure, flow, or liquid level, require the supply of the controlled medium to be equal to the demand, but the period of time

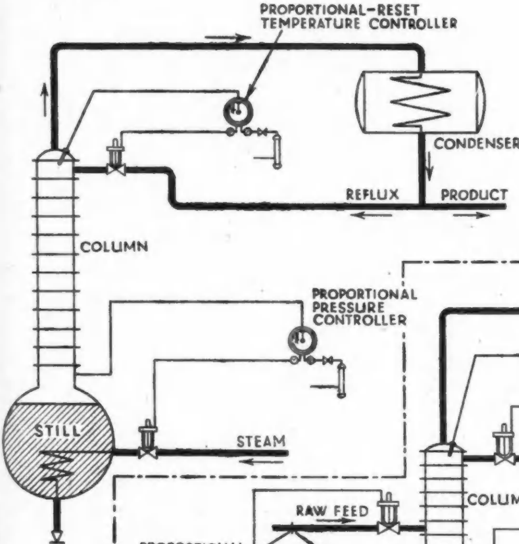


Fig. 4 (left). Heat control applied to a batch distillation column.

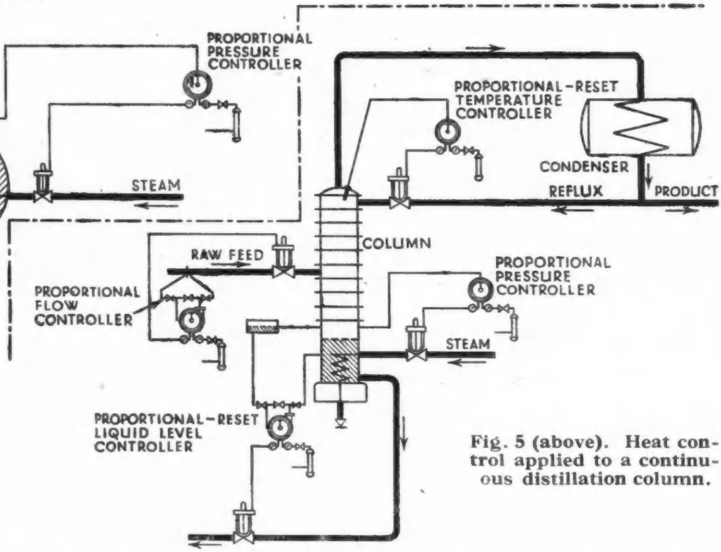


Fig. 5 (above). Heat control applied to a continuous distillation column.

over which these equalities must exist might vary widely. This time-element is a determining factor in classifying individual applications and in deciding the most desirable method of control. As an example, a simple batch distillation column will be taken (*see* Fig. 4). For distillation to be practical it is necessary to ensure a steady flow of vapours up the column and, further, the temperature of the overhead vapours must be held constant for any one fraction.

Consider first the flow of vapours up the column. The first effect of any change in the rate of vaporisation from the still will be a change in pressure between the liquid face and the first stripping tray. The cause of such a change in the rate of vaporisation would be incorrect relationship between the heat supply and the latent heat of vaporisation. Therefore, the rate of vaporisation may be controlled by a pressure-controller operating with the controlled valve in the steam line to the heating coils. In fact, heat control by pressure.

During heating-up, the mass of liquid in the still represents a large favourable capacity, but once the liquid has attained its boiling temperature, relatively small changes in the heat supply would cause appreciable changes in the rate of vaporisation. Therefore, the rate of steam supply must, at all times, be proportional to the demand, and throttling action control is necessary.

In the course of removing the various fractions, the temperature in the still must be progressively raised, necessitating a gradual increase in the rate of the steam supply which represents a considerable change in load. It is a fact that on applications where a wide change in load exists, the proportional-reset controller is the only theoretically correct instrument to use if an absolutely constant control point is to be maintained. Nevertheless, since on this application the throttling range normally used is not excessively wide, and in view of the fact that a slight deviation off control point over a long period will not produce upsetting conditions in the column, proportional controllers can

be used successfully in all but a few cases.

Regarding the overhead vapours, it is obvious that under conditions of constant pressure (atmospheric or otherwise) the criterion is temperature control, and this temperature is most effectively held by varying the rate of flow or reflux passed back into the column. Clearly, the control action must be of the throttling type, but in this case the process lags are predominantly unfavourable and the time taken for the column to reach a state of balance after a change in the reflux rate is considerable. Therefore, proportional-reset control is essential apart from the fact that an absolutely constant control point must be maintained throughout each fraction.

Considerations in a continuous column are similar. Certainly, the temperature controller for the overhead vapours is identical except that it will be set to maintain one constant temperature throughout. However, the conditions of feed and vaporisation are different (*see* Fig. 5). The primary variable in this case is clearly the continuous feed, which must be held constant at all times because it controls the rate of vaporisation up the column. The type of controller used is naturally dependent on the particular feed lay-out and, while proportional-reset control is very often necessary, a large number of applications are completely successful using proportional action, as long as possible liquid-head variations, or other factors giving the effect of a load change, are not excessive.

When re-heating is carried out in the base of the column, the steam to the re-heating coils is controlled by a pressure controller as in the batch column, but in instances where a separate re-boiler is used the steam should be regulated by a temperature controller. The difference is due to the fact that, with a separate re-boiler, it is required to pass back into the column only those vapours which have a temperature below a certain maximum, whereas when re-heating directly in the column base, the column conditions must also be taken into consideration.

Finally, the level of liquid in the base must be controlled. From an operational point of view the principal factor is that the control action must be truly "throttling," and in operation it must not produce surges or upsetting conditions. These considerations would normally be satisfied by a controller with proportional action, but experience has shown that on some applications the "column" is extraordinarily sensitive to the slightest level-change and, therefore, success can be assured only when using a proportional-reset controller.

Discussion

Q. Can the effect of gusty weather be eliminated on a coke oven when using a stack-draught controller; and why, with such a controller, does the effect of the reversal of the fuel gas show by both an increase and a decrease in draught?

A. A stack-draught control application on a coke oven is difficult because, in addition to taking care of the normal operational changes in the coke-oven flues, such a controller has to correct for the effect of weather conditions over the stack and also the reversal of the fuel gas. For these reasons it is essential on this application to use a controller with proportional action and reset. Even with such an instrument it cannot be said that the effect of very gusty weather can be entirely eliminated, but its effect is reduced to a minimum and to a stage where for all practical purposes it has no real effect on the operation of the ovens. With regard to the reversal of the fuel gas, the reason why this is recorded on the chart by an increase and decrease in draught is that a slight over-correction is permitted in this case in order to maintain the normal operating conditions more closely. On some of the older coke ovens, controllers with proportional action only have been fitted, and with this type of instrument it is necessary to operate with the throttling range rather too narrowly in order to maintain something like a reasonably steady control under normal operation.

Valve-Characteristic Distortion

Q. Referring to Fig. 3, which shows the ideal characteristic for an automatic controlled valve, and appreciating that this characteristic is in practice distorted according to the ratio between the pressure-drop through the valve and that through the pipe-line, fittings, etc., how much distortion will the valve characteristic stand before the control begins to suffer?

A. Unfortunately, it is not possible to give a very direct answer to the question. In the first place, consideration must be given to the difficulties of the control problem, and some judgment made as to the variation in rates of flow through the valve necessary to correct for plant changes. It will be clear from what I have already said that the valve will only maintain its full range ratio of 50 : 1 under conditions where the majority of the available dynamic pressure loss is caused to occur across the controlled valve. It follows, therefore, that if it is necessary for the valve to work through almost its total range, then it is essential for the majority of the dynamic pressure loss to occur across the controlled valve, but as this range ratio is gradually reduced with the simpler control applications, so is it permissible, though I would not say desirable, to allow a lower ratio between the dynamic pressure loss across the controlled valve and that through the pipe-line and fittings.

Q. How would one control a batch still with reflux control, assuming the still to be producing a pure product boiling at 100°C. How is it that it is possible to work with the minimum necessary reflux because, while a rise in temperature will increase the amount of the reflux, there is no corresponding fall in temperature to limit it?

A. I am afraid that with the time at my disposal I cannot give a complete answer to this

question, because with distillation it is first of all necessary to lay down the conditions of operation, the degree of purity required, etc. If we assume control of the reflux by temperature then it does not follow that the temperature-sensitive element need necessarily be installed in the vapour outlet from the column where the temperature will be constant or, for that matter, in the top of the column at all. While this is quite a common arrangement on continuous columns, I cannot say whether it would be practical on a batch column without full details of operating conditions and information regarding other cuts which have to be taken. Another possible alternative is to flow-control the reflux, but when this method is adopted the general plant control is normally somewhat different from the recognised arrangement when operating with reflux control by temperature. This is a typical example, where, if best results are to be obtained, it is desirable to consider and discuss the question of control instruments when the plant is in the design stage, although it is not impossible to add them afterwards. It can, however, be taken for granted that one way or another satisfactory control can be given on columns distilling pure products.

Q. How would the author control the pipe-still of a distillation plant when the operating conditions are such that a high wind may have a cooling effect on one side of the furnace, with the result that heavier firing is needed on the cooler side ?

A. In such a case as this where the oil stream is split along each side of the furnace, then each side of the furnace must be fired independently of the other. Two separate control systems are then used, controlling the outlet temperature from each split stream, which will automatically take into account the cooling effect on one side, as a result of high winds, or for that matter underbalanced conditions from any source.

Servicing Arrangements

Q. What arrangements can be made to-day for servicing instruments ?

A. I believe I am correct in saying that all industrial instrument manufacturers make arrangements for the routine servicing of their own instruments. Under normal industrial conditions, and using instruments correctly designed and applied, very little servicing should be necessary, excluding, of course, routine duties, such as changing charts, winding clocks, filling the pen with ink, etc. If frequent servicing is unavoidable, I believe it will usually be found to be due either to the instruments being installed in a corrosive atmosphere, or, with air-operated controllers, dirty air being supplied to the instruments, etc. I think that in most cases such troubles are avoidable provided they are made known to the manufacturers. Obviously, the question of supplying dirty air to instruments is avoidable and the remedies are known. In the case of instruments installed in a corrosive atmosphere, the trouble in my experience has always been overcome by purging clean air into the instrument case. Where there are a number of instruments in one works it is obvious that it is desirable for one man to be detailed to look after them and, of course, if and when a serious fault develops then the services of the manufacturers should be called in. Where the author's firm carries out regular servicing, it has not been found necessary to pay more than about three visits a year, and often two visits are sufficient. Complete servicing facilities are available from the various instrument manufacturers and a suitable number of service calls per annum can be worked out to suit the requirements of each individual installation.

A speaker mentioned that his firm had used and had had considerable experience with instruments manufactured by the author's firm and during the past 15 years it had only been necessary to call in the aid of the makers two or three times.

CO_2-Recorders

Q. The author appears to give the impression that servicing is rarely required, and that the user can just leave the instrument to itself. The experience gained during the Fuel Efficiency Campaign has shown that the majority of instruments in certain classes were out of commission, because (*a*) they had gone wrong and no one at the works had realised the need for servicing, or (*b*) they had gone wrong so frequently that their owners had become tired of trying to make them work. CO_2-recorders were particularly bad offenders.

A. Regarding the first part of the question, if instruments go wrong or fail and are not re-commissioned, then this is a problem for the works management. Clearly, the position is that the management has invested certain capital in the instruments concerned, and such investments will not bear any interest unless the instruments are kept in a satisfactory operating condition so that greater efficiency is secured by their use. Regarding the second part of the question, the remarks which I made earlier regarding servicing were not intended to apply to CO_2-recorders. It is true that CO_2-recorders, particularly those of the chemical absorption type, do require more frequent servicing if the best is to be obtained from them. This additional servicing should be recognised as part of the running expenses of such an instrument, but in spite of these additional maintenance charges the benefits derived by an accurate knowledge of the CO_2-content of flue gases should more than outweigh the additional expense as compared with other types of instrument used in industry.

Q. Does not the chief wastage of steam occur in the space-heating of factories and for domestic purposes ? In some factories the steam is just turned on and left on regardless of the temperature.

A. The automatic control of room tempera-

tures is comparatively simple and both on-off and proportional action are used, although in the majority of cases such applications are successfully handled by on-off controllers. When applying such controllers, it is important to instal the temperature-sensitive bulb in such a position that it is representative of the average room temperature. I must agree that, in some cases, wastage of steam does occur on these applications, and while it is true that it is sometimes necessary to use quite a number of individual controllers to maintain the temperature in comparatively small sections or individual rooms of a main building, this would not normally justify such wastage, because in the majority of cases a simple and inexpensive thermostat or damper control can be used.

Distance-Transmission Systems

Q. How do you control a source of heat when the temperature has to be measured at a distance from the source of heat ?

A. In such cases the standard types of temperature-control equipment are used, but a distance-transmission system has to be interposed between the measurement of the temperature and the automatic control mechanism which is normally located near the source of heat. There are several ways in which this can be accomplished, depending on (1) the range of temperature ; (2) the speed of response necessary to effect satisfactory control ; and (3) the distance involved. With normal long distances, that is, say, 500 to 1000 ft., and where the temperature is above, say, about 1000°F. it is usual to use a potentiometer-type temperature recorder or controller, but where the temperatures are below 1000°F. it is usually preferable to use an expansion-type thermal system with pneumatic distance-transmission. Some people may believe that the pneumatic transmission system is very slow in response. It is true that in normal circumstances it is slower than an electric system, but the only factor of importance is that the temperature measurement coupled with its transmission system should have a rate of response faster than the process can change. Actually, with a pneumatic transmission system, the initial response occurs at the velocity of sound. As will be appreciated, in process control, the initial response showing the direction of change is perhaps more important than the final balance point.

Q. How would you deal with the wastage of steam that may arise when it is necessary to heat an open vessel to the boiling point only and keep it simmering. Very often a man opens a valve, blows steam into the liquid, and then forgets to shut it off when the liquor begins to boil ?

A. In many ways this does represent a difficult control problem because, obviously, no controller, however sensitive, can be set to control exactly on the boiling point of any liquid. The best method of approaching this problem would seem to be to set the control instrument to operate just slightly below the boiling point, and it would not be impossible for it to be set, say, 0.1°C. below the boiling point. It will be appreciated, however, that the boiling point will change with variations in the atmospheric pressure and such a control instrument must therefore necessarily embody barometric compensation. Another factor sometimes complicating this application is the possibility of a change in the specific gravity of the liquid, but here again it would not be impossible to incorporate, in such an instrument, compensation for such changes. Clearly, for such a duty, it would have to be a high-grade controller of correct type applied in such a manner that the highest precision in control was obtained. Possibly in a good many cases it would be satisfactory to set the control point, say, 2° or 3°C. below the boiling point in order to avoid the complication of barometric and/or specific-gravity compensation.

Size of Valves

Q. Can some imformation be given upon valve sizes ?

A. Instrument manufacturers are often requested to keep the pressure-drop through a controlled valve down to an absolute minimum. The pressure-drop through a controlled valve is not as a rule, a matter of choice, but is dependent entirely on plant conditions. With every controlled-valve installation there is a certain difference between the pressure which, say, a pump is capable of developing and that pressure used up as a result of hydrostatic head lift and frictional loss through the pipe-line and the fittings, and it is this difference which affords the means of control and represents the permissible pressure-drop through the controlled valve. This pressure-drop will exist in practice, and if any lower pressure-drop is used in the calculation of the valve-size then the valve may, in point of fact, prove to be too large and control will be difficult, if not impossible. Again, if the size of the controlled valve works out to be as large as three-quarters of the diameter of the pipe-line in which it is fitted, then the highest precision in control should not be expected, particularly, if the control problem is a difficult one. If it is the same size as the pipe-line, then control may prove difficult even in the simpler applications. In order to obtain the highest precision in control, the valve size may first be calculated, neglecting the frictional loss in the pipe-line. Then, the valve having been computed, the pipe-line should be made twice the diameter of the controlled valve and then, of course, the valve size is re-checked, taking into account the corresponding pipe-line frictional losses. In most cases it will be found that under these conditions where the pipe friction is obviously made small by comparison with that through the controlled valve, it will normally work out at the same size.

New Step in Coal Analysis

The Mechanism of Coking

A GREAT step forward has been made in the knowledge of the structure of bituminous coal. This was revealed by Professor H. L. Riley, of the Inorganic Chemistry Department of King's College, Newcastle, at the annual meeting of the local section of the Society of Chemical Industry on May 4. Professor Riley, in his paper, which dealt with the X-ray investigations of bituminous coals and the conclusions reached concerning the fundamenal structure, outlined the results obtained by the workers in his department.

X-Ray Analysis

The direct chemical analysis of coal substance had seemed to have reached its limit which, in this country, had been explored by the late Professor Bone and his school. It would be remembered that a pioneer in this work, particularly in the field of solvent extraction, had been Professor Bedson, of King's College. The next stage in the coal investigation had been the introduction of the technique of X-ray analysis. A start was made by comparing the diffraction patterns from Ceylon graphite, Durham coking coals, Northumberland non-coking coals, and Welsh and other anthracites. The pattern was much less precise in the case of the bituminous coals. It was possible to assign two dimensions to a fundamental unit of structure by calculation from the X-ray results. Since only two dimensions were obtained for a three-dimensional structure it was reasonable to take this as a cylinder. The so-called *a* dimension was the diameter and the *c* dimension the height. The interesting discovery was the way in which *c* varied with the coal and the stage in coking. Cellulose chars gave a constant value of *c* at all stages of heat-treatment. The same was true of the anthracite group of coals and for fusain.

The difference in behaviour of the bituminous coals, and in particular of the coking coals, suggested that there was a component present that was missing in the case of cellulose and fusain. Photometric analysis of the diffraction photographs showed that intensity curves were not simple but built up of two components. This was revealed either in the presence of a dip in the intensity curve or else by its asymmetry. In order to separate a possible second component which produced this result from the coal, the technique of solvent fractionation was used. This demonstrated that the extracted coal did not show the peculiar behaviour of the *c* measurement. It was decided that the behaviour of pitch would be followed by the same technique. First, on coking it was found that the *c* measurement followed the course similar to that in the coking coal. Extraction of the pitch with carbon tetrachloride gave a product which also belonged to the same group.

A mechanism was now suggested for the behaviour of the coking coal. In the non-coking coals there were polynuclear sheets held together by oxygen linkages which gave structural rigidity to a unit group, so that, with heating, the group remained constant in size, there being, in fact, no change in the *c* value. In the case of the coking products, however, there was also present a material which was composed of sheets or discs which were not held together by oxygen linkages. The change in the *c* value indicated that with increase in temperature there was first a considerable increase in the value of *c*, then a decrease to a minimum, and finally a steady upward trend. Experiments with a model composed of discs had shown that agitation of a random mixture of these discs produced aggregation of numbers of discs into cylinder form. In other words, by agitation, order was produced out of disorder, and the *c* dimension which corresponded to the length of the cylinder of discs was actually increased. This model was demonstrated and pictures shown of the change from disorder to order. It would seem that in the coal itself the polynuclear discs were agitated by the rise in temperature, and arranged themselves to increase the *c* value. It would appear that with further rise in temperature there would be more violent molecular agitation and the disorder state would again be reached. The final rise in the value of *c* would come from the crystallisation of the polynuclear sheets into a graphite structure.

Testing the Mechanism

In order to test the proposed mechanism an attempt was made to interfere with the action by geometrical means. A 2 per cent. solution of the pitch extract was put on to magnesium oxide just sufficient to wet it. This mixture was then heated. No change was obtained in the *c* value. A mechanical model of this was demonstrated which consisted of cubes, representing the magnesium oxide, and the discs previously used. No aggregation could be produced.

The problem was now to obtain a pure substance which gave the same behaviour. This needed to be a compound which was polynuclear, contained a little oxygen, was not easily volatilised, and behaved, in a general way, similarly to the pitch extract. It was known that pure hydrocarbons were

not adequate since they volatilised too easily. After some time the idea occurred to try some vat dyestuffs. Professor Clemo, of the Organic Chemistry Department of King's College, suggested a structure of the Caledon jade green type; and dibenzanthrone was tried. This gave the correct reaction by the simple British Standard coking test. This was the first material of known structure shown to possess coking properties.

The disclosure by Professor Riley of this advance in coal science has great interest. A new door is opened by physical means which will permit the organic chemists to play a rôle once more in the analysis of our national source of power. The practical significance of the work lay in the possibilities of imposing coking properties on non-coking coals. In the past, pitch had been mixed with the coal but the efforts had not been adequate. The reason was now clear; much better mixing and control were needed and the research showed the way. There was now no danger of the exhaustion of coking coal in this country.

Zein Acetate Preparations

New Patent Process

DETAILS of a patented process for making Zein acetate are given in *Paint Technology* (Jan., 1944, p. 16). Films and coatings prepared from this material are said to be stronger, more flexible and more water-resistant than those of zein itself. Acetic anhydride, glacial acetic acid, acetyl chloride, and ketene are suitable acetylating agents for the process, a catalyst such as sulphuric acid or anhydrous sodium acetate being added to accelerate the reaction.

In British Patent 532,589, Corn Products Refining Co., of New York, state that zein acetates have been made with acetyl contents varying from 2.8 per cent to 6.8 per cent., so apparently more than one acetyl group can be attached to the zein molecule. In the acetic anhydride method, enough of the actylating agent should be used to suspend the zein completely when heat is first applied; the amount required is more than 200 per cent. by weight on the zein. Sulphuric acid appears to be the best catalyst; the amount required is 1-3 per cent. by weight on the zein. For example, a mixture of 100 parts by weight of zein, 220 p. acetic anhydride, and 1 p. commercial concentrated sulphuric acid is refluxed in a boiling water-bath for 1-3 hr., and the zein acetate, precipitated by spraying into cold water, is washed with water and air-dried. The same procedure is followed if acetic acid or acetyl chloride is used.

Ketene is a gas; with this acetylating agent the zein must be suspended in a liquid inert both to ketene and to zein. If an excess of the gas is bubbled through a suspension of 100 p. zein in 800 p. toluene, with 4 p. potassium acetate added as catalyst, a product containing 5.27 per cent. acetyl is formed. Zein acetate is insoluble in toluene; it is filtered, washed thoroughly with toluene, and dried. With acetic anhydride as catalyst, a zein acetate containing about 2.8 per cent. acetyl is produced. Replacing the toluene by acetone results in a product containing 3.65 per cent. acetyl, the same as when toluene is the suspending medium and no catalyst at all is used.

Zein acetate differs from zein in being insoluble in ethyl alcohol of any concentration. It is, however, soluble in mixtures of 95 per cent. ethyl alcohol with either butyl lactate or ethylene glycol monoethyl ether, the ethyl alcohol comprising 50-80 per cent. of the mixture. Films from such solutions are said to be stronger, more flexible, and more water-resistant than films of zein or plasticised zein.

Kalium, Ltd.

List of Member Firms

THE Ministry of Supply, Sundry Materials Branch, has approved that the undermentioned firms shall comprise the membership of Kalium, Ltd., which company is the appointed agent of the Department for the distribution of commercial caustic potash and carbonate of potash. These commodities are distributed under conditions laid down by the Ministry and approved users can obtain supplies on application to the undernoted firms.

Caustic Potash Section: F. W. Berk & Co., Ltd., London; Bush, Beach & Gent, Ltd., London; Johnson & Sons (Mfg. Chemists), Ltd., London; McKesson & Robbins, Ltd., London; Chas. Page & Co., Ltd., London, Glasgow, and Sale; L. R. B. Pearce, Ltd., London; H. M. Roemmele & Co., Ltd., Glasgow; Frank Segner & Co., Ltd., Manchester; J. M. Steel & Co., Ltd., London and Manchester; C. Tennant, Sons & Co., Ltd., Pinner, Middlesex; and V. & T. Weissberger, London.

Carbonate of Potash Section: F. W. Berk & Co., Ltd., and Major & Brinkman, Ltd., London; Bush, Beach & Gent, Ltd., London; Garthwood Company, Ltd., London; R. W. Greeff & Co., Ltd., Bishop's Stortford; A. Hoffmann & Co., Ltd., Bradford; Millwards Merchandise, Ltd., Manchester; Chas. Page & Co., Ltd. London, Glasgow, and Sale; L. R. B. Pearce, Ltd., London; H. M. Roemmele & Co., Ltd., Glasgow; Sir S. W. Royse & Co., Ltd., Manchester; Frank Segner & Co., Ltd., Manchester; J. M. Steel & Co., Ltd., London, and Manchester; Stephens Bros. & Banner, Ltd., London; and Union Oxide & Chemical Co., Ltd., Flitton, Bedfordshire.

Parliamentary Topics

More Penicillin Questions : Caustic Soda Effluent

FURTHER questions about penicillin were asked in the House of Commons last week. Mr. A. Edwards asked the Minister of Supply whether he could now give any estimate of when supplies of penicillin would be available for general use in Britain. Mr. Peat replied that the production of penicillin was being increased as rapidly as possible. He regretted that it was not possible to give any reasonable estimate of the time when supplies would be available for general use here, as that must depend on Service requirements, among other things.

500 Million Units

In answer to a question from Major Lyons, the Lord President of the Council (Mr. Attlee) circulated through *Hansard* a statement with regard to the allocation of penicillin supplies. The following are the main points from that statement: The Penicillin Clinical Trials Committee appointed by the Medical Research Council is responsible for the distribution only of the part of the penicillin supply which is allocated for research in this country, the remaining and larger part is going to the Forces overseas. The total quantity distributed by the Committee up to the end of March, 1944, was about 500,000,000 units, of which about 420,000,000 units were divided between the hospitals in Oxford, London and Edinburgh chosen as the main centres for clinical trial. The committee has also provided smaller supplies for specific clinical purposes to 14 other centres in this country, and 16 further projects for particular forms of study were approved at a recent meeting. The aim of these clinical trials was to treat cases under controlled conditions in order to determine the value of penicillin in different diseases and the best methods of its use. No proposal for any promising investigation has been rejected owing to shortage of supply.

Magnesium Elektron's Caustic Soda

Mr. Ellis Smith asked the Minister of Aircraft Production (1) if he was aware that the Magnesium Elektron, Ltd., is pouring caustic soda into the sea; how long is the pipe-line used for that purpose; what did it cost; why, in view of the fact that his department has assisted the expansion of this firm, this waste is permitted; and with what other firms is Magnesium Elektron, Ltd., connected; (2) if his attention had been directed to the revelations in the case of Thompson, H.M. Inspector of Taxes, *versus* Magnesium Elektron, Ltd., and the restrictions contained in an agreement made between Magnesium Elektron, Ltd., and I.C.I., providing that the former company should not sell caustic soda and other by-products; whether this agreement had remained in force during the war; how it has affected out total war effort; and how the company was disposing of the caustic soda produced.

Sir Stafford Cripps replied that he had seen the report referred to in the second question. From it he gathered that in 1936 I.C.I. paid Magnesium Elektron a sum of money in return for an undertaking by that company not to make liquid chlorine or caustic soda, and to buy from I.C.I. the chlorine required in the manufacture of magnesium. The agreement, however, contained provisions which permitted Magnesium Elektron to make chlorine under certain conditions. He understood the agreement was still in force. The arrangements made under it did not affect the supply position of caustic soda required for war purposes.

In regard to the first question, continued Sir Stafford, the facts were that from a Government factory managed by Magnesium Elektron under an agency agreement, a solution containing a low percentage of caustic soda was produced as a by-product and was discharged into tidal water by means of a pipe-line. The pipe-line was about 27 miles in length and, together with the necessary ancillary equipment, cost approximately £86,000. Measures to recover the caustic soda would have involved a capital expenditure of the order of £250,000; in view of the supply position of caustic soda, the erection of such recovery plant would not have been justified. Magnesium Elektron, Ltd., was a private company, and information was not, therefore, available regarding other firms with which it was connected.

Mr. Smith: Is it not a fact that 10 per cent. of each gallon of liquid poured into the sea would produce one pound of caustic soda; that several products which can be produced from caustic soda are in short supply and are affecting our war effort, and seeing that the restrictive agreement is still in force, will the Minister take steps to see that this caustic soda is used. Sir S. Cripps: The restrictive agreement does not apply to a Government factory anywhere. I cannot confirm the figures given as regards the use of caustic soda from the effluent, but no further caustic soda is required at the present time.

Mr. Shinwell: Cannot the Minister answer the simple point? Has this firm entered into a restrictive agreement with I.C.I. which prevents it selling caustic soda.—Sir S. Cripps: I have already answered that in 1936 such an agreement was entered into between I.C.I. and this firm, but it does not relate to the factory in which the caustic soda is manufactured.

Mr. Shinwell: Does the agreement operate

now?—Sir S. Cripps: I have answered that to the best of my knowledge it is in force.

Effluent Disposal Concession

Rear-Admiral Beamish asked the Minister of Aircraft Production with what object the Foundry Services, Ltd., Order, 1944, had been issued, and what efforts were being made to purify the effluent before discharge into a clean stream.—Sir S. Cripps said the object of the order was to authorise the discharge of an effluent arising from the manufacture of a product needed for the efficient prosecution of the war. Steps were being taken to dilute the effluent, before its discharge into the stream, to a degree which the Water Pollution Research Laboratory were satisfied was sufficient to render it harmless. When the installation was complete the effectiveness of this method would be tested on the spot by an officer of that laboratory.

Research within the Empire

Mr. Salt asked whether advantage would be taken of the presence of the Dominion Prime Ministers in this country to discuss the desirability of establishing some better machinery for the advancement and co-ordination of scientific research and development in all parts of the British Empire.—Mr. Attlee (Deputy Prime Minister): This matter will certainly receive consideration.

Personal Notes

The Birmingham Chamber of Commerce has elected MR. KENNETH H. WILSON, J.P., chairman of Albright & Wilson, Ltd., as its president.

DR. W. BLAKEY has been appointed the Society of Chemical Industry's representative on the B.S.I. technical committee dealing with aminoplastic moulding materials.

MR. H. C. GREEN, who has been general manager of J. C. & J. Field, Ltd., soap manufacturers, for 34 years, and deputy chairman for eight years, has been elected chairman of the board.

For their work in connection with the war-time supply of vitamins, the following Russian scientists have been decorated by the Soviet Government with the Order of Lenin: ACADEMICIAN ALEXEI BACH, ACADEMICIAN ALEXANDER PALLADIN, PROFESSOR ALEXANDER SCHMIDT, PROFESSOR FEDOR KROTKOV, and PROFESSOR GEORGE LEBEDEV.

Among the deputation which called on the President of the Board of Trade last week to urge the inclusion of the South Tees-side in the N.E. Development Scheme were MR. A. T. S. ZEALLEY (chairman and joint managing director, Billingham Division of I.C.I., Ltd.) and ALDERMAN T. MEEHAN (representing the Iron and Steel Trades Confederation).

MAJOR E. L. HOBSON, of the Quartermaster Corps, U.S. Army, was recently entertained to lunch by the committee of the Plastics Group on the occasion of his official visit to this country in connection with plastics supplies.

MR. A. HEALEY, a director of the Dunlop Rubber Company, has been awarded the Colwyn Gold Medal by the Institution of the Rubber Industry, for conspicuous services in connection with the technique of tyre manufacture, with special reference to the use of synthetic rubbers.

A fund in memory of the late MISS H. C. M. WINCH, A.R.I.C., whose death was reported in our issue of April 15, has been instituted. It will be administered by a committee of ten, the secretary of which is Mr. S. Bruce, 55 Villette Road, Sunderland.

The Institution of the Rubber Industry, Leicester Section, has appointed the following officers: *Chairman*, MR. R. J. METCALFE; *hon. secretary*, MR. N. G. HISCOX; *committee*, MR. S. W. ATHERLEY, MR. H. GAMBLE, DR. C. M. BLOW, MR. L. G. SHELTON, MR. W. H. SWIRE.

The committee elected by the London Section of the Institution of the Rubber Industry at its annual meeting comprises the following members: H. C. BAKER, J. A. BIDMEAD, H. A. DAYNES, M. M. HEYWOOD, GEORGE MARTIN, C. R. PINNELL, P. F. SCHIDROWITZ, H. J. STERN, W. H. STEVENS, R. J. TUDOR, H. F. WILSON, and J. WILSON.

Details of the membership of the Plastics Group's committee were published in our issue of May 6 (p. 432). At the annual general meeting on Monday two more members, DR. V. E. YARSLEY and DR. K. W. PEPPER (Chemical Research Laboratory, Teddington) were elected, and it was stated that MR. C. DIAMOND would remain on the committee. The retiring chairman, Mr. E. G. Couzens, paid a tribute to the work done by MR. N. J. L. MEGSON during his seven years as hon. secretary, in which post Mr. Megson is now succeeded by DR. S. H. BELL.

At the annual general meeting of the Manchester Section of the Society of Chemical Industry on April 21, the following offiers were elected: *Chairman*, MR. F. SCHOLEFIELD; *vice-chairman*, MR. C. GYSIN; *hon. secretary and treasurer*, DR. W. H. BRINDLEY. *Committee*: MISS RONA ROBINSON, MR. J. H. CLAYTON, MR. T. HORNER, DR. F. KIND, and MR. A. McCULLOCH. *Group representatives*: MR. W. COWEN (Chemical Engineering), DR. W. J. S. NAUNTON (Plastics), DR. T. K. WALKER (Food), and MR. D. M. WILSON (Road and Building Materials).

The following officers of the London Section of the Society of Chemical Industry were re-elected at the annual general meeting: *Chairman,* DR. R. T. COLGATE; *hon. secretary and treasurer,* MR. T. W. JONES; *hon. recorder,* MR. J. U. LEWIN. The members of the committee are: H. BAINES, A. H. BENNETT, D. F. DIXON, T. H. DURRANS, B. A. ELLIS, J. G. FIFE, D. V. N. HARDY, S. J. JOHNSTONE, R. LESSING, R. C. CHIRNSIDE, J. C. SWALLOW, T. RENDLE, T. F. WEST, W. H. J. VERNON.

Obituary

MR. ERNEST HODGSON KERFOOT, chairman of Kerfoot & Son, Ltd., chemical manufacturers, of Bardsley, Lancs, died on April 27, aged 64.

Canadian Chemistry and Process Industries records the death of one of the pioneer members of the Canadian Institute of Chemistry, SIR GEORGE GARNEAU, who died on February 5 at the age of 79. Emeritus Professor of Analytical Chemistry at Laval University, he had been a Fellow of the Institute since 1920. He was a member of the National Research Council in its early days.

The death is reported of DR. WILLIAM HOWARD MARTIN, professor of chemistry at the Toronto University, on February 22 at the age of 54. His own researches were in connection with light scattering, Raman effect and photochemical reactions. During this war he had undertaken chemical research for the Department of National Defence, and he lately organised a four months' course for chemical technicians. He was president of the Canadian Institute of Chemistry for the year 1939-40.

Chemical Society's President

Carbohydrate Research

PROFESSOR WALTER NORMAN HAWORTH, the newly-appointed president of the Chemical Society, was born at Chorley, Lancashire, in 1883. He became a pupil of Professor H. B. Dixon and Professor W. H. Perkin at the University of Manchester at a time when the Manchester School of Chemistry was at the height of its fame. Others of his tutors were also Dr. J. F. Thorpe and Dr. W. A. Bone, later of the Imperial College; Mr. D. L. Chapman, of Jesus College, Oxford; and Dr. Charles Weizmann. Among his fellow-students were Professor Sir Robert Robinson, Professor J. L. Simonsen, Dr. R. E. Slade, Dr. E. W. Smith, Professor J. H. Andrews, of Sheffield, and the late Professor V. J. Harding, of Toronto. After graduating B.Sc., with first-class honours in chemistry, Haworth was appointed private research assistant to Professor W. H. Perkin, with whom he published a number of papers on the constitution and synthesis of the terpenes, including sylvestrene. His researches in this field were continued at the University of Göttingen under Professors Otto Wallach and G. Tammann. He graduated Ph.D. at Göttingen in 1910, and took the D.Sc. at the University of Manchester in 1911 after returning to resume his work with Perkin.

In 1911 Haworth was appointed to the teaching staff of the Imperial College of Science, eventually becoming Lecturer and then Reader in Chemistry at the University of St. Andrews. From 1920 to 1925 he served as Professor of Organic Chemistry and Director of the Department of Chemistry at King's College, Newcastle-upon-Tyne. He was elected F.R.S. in 1928. For the past 19 years he has held the Mason Chair of Chemistry in the University of Birmingham.

Professor W. N. Haworth, F.R.S., President of the Chemical Society.

His later researches have been concerned with the chemistry of the carbohydrates and vitamin C. Some 200 papers on these subjects, emanating from his laboratory, have led to the determination of the modern structures which have been allocated to the simple sugars, the disaccharides, and the polysaccharides such as starch, glycogen, cellulose, and others of bacterial origin. The constitution of ascorbic acid was worked out and the synthesis achieved in collaboration with his pupils and colleagues, among whom was Professor E. L. Hirst, now of Bristol. For this work on carbohydrates and vitamin C, Professor Haworth was awarded the Nobel Prize for Chemistry in 1937.

He received the honorary Sc.D., Cambridge, in 1939, the honorary D.Sc. of Zürich in 1937, the Longstaff Medal of the Chemical Society in 1930, the Davy Medal of the Royal Society in 1934, and the Royal Medal of the Royal Society in 1943. He was a member of the Council of the Royal Society in 1931-2, and is Dean of the Faculty of Science in the University of Birmingham.

General News—From Week to Week

The International Rubber Regulation Committee has been dissolved.

The Society of Chemical Industry has applied for membership of the Parliamentary and Scientific Committee.

The firm of R. Sumner and Co., Ltd., the Liverpool manufacturing chemists, have just celebrated their centenary.

Roche Products, Ltd., have acquired new premises for a Scottish depot at 665 Great Western Road, Glasgow, W.2 (Phone: Western 6369).

The report of the geological survey recently conducted in Teesdale and Weardale is to be published. This information was given by the Lord President of the Council last week.

Fuel Efficiency Bulletins No. 29 (The Industrial Use of Compressed Air) and No. 30 (The Unorthodox Use of Economisers) are now obtainable free of charge from the Ministry of Fuel or its Regional Offices.

Components for 2500 prefabricated steel houses will be produced each week when production starts at the beginning of next year. This figure was given by Lord Portal in Parliament last week.

The first Baekeland Memorial Lecture, endowed by Bakelite, Ltd. will be given at a London meeting of the Plastics Group of the S.C.I. during the next session. The lecturer will be Mr. H. V. Potter.

Workers in 323 firms and organisations in England and Wales joined the Red Cross Penny-a-Week Fund during April. Employees of more than 45,000 firms are now contributing each week.

Factory occupiers who were eligible for an allowance of towels in 1943 are reminded by the Board of Trade that the 1944 ration is now available. They should ask their District Inspector of Factories for form of application M/L 2050 (1944).

The dyeing of glass-fibre fabrics is the subject of British Patent No. 559,068. The fabric is impregnated with a solution of aluminium formate or acetate, dried to convert the salt into alumina, and then treated with the dye.

The Machinery, Plant and Appliances (Control) (No. 7) Order, 1944 (S.R. & O. 1944, No. 488), which came into force on May 8, makes alterations to the schedule to the corresponding No. 3 Order (1942), and to the general licence accompanying that Order (*see* THE CHEMICAL AGE, December 19, 1942, p. 563). Further alterations are made by two new general licences (S.R. & O. 1944, Nos. 489, 490) dating from April 28, and cancelling S.R. & O. 1943, No. 1167.

A simple photo-electric fluorimeter, suitable for measuring the fluorescence of solids or liquids under ultra-violet light and operating off ordinary 230-volt A.C. mains, is described in *Chemistry and Industry*, 1944, 19, p. 173.

The only changes in the prices of unrefined oils and fats allocated to primary wholesalers and large trade users for the four weeks ending June 3 are: Sperm oil (per ton ex store; drums included): crude heads and blubber reduced to £61, carcase reduced to £59, No. 3 reduced to £58.

A leaflet (Publication No. 901), giving full particulars of their range of Monitor Roller Mills has been published by the Pascall Engineering Co., Ltd., 114 Lisson Grove, London, N.W.1. This firm will shortly be putting into production a larger-sized roller mill, details about which will appear in THE CHEMICAL AGE in due course.

Trials to test the efficiency of patulin (*see* THE CHEMICAL AGE, 1943, *49*, p. 528) have been carried on during the past winter in various industrial establishments. The results are now being analysed by the Medical Research Council, and when this work is complete a statement will be issued. In the House of Commons last week, the Lord President of the Council said that unless there was definite evidence of patulin's value it would not be justifiable at present to encourage large-scale production.

In a letter to the Press, Mr. E. J. Bloomfield, acting secretary and registrar to the Chartered Institute of Patent Agents, protests that the existing procedure for the extension of a patent term application involves unnecessary hardship to patentees, many of whom are thus deterred from making a justifiable claim for extension. At present, application must be made to the High Court, with inevitable trouble and expense, and Mr. Bloomfield considers that the matter should be dealt with by the Comptroller-General.

Two memoranda entitled respectively "The Heat and Oil Resistance of Natural and Synthetic Rubber" and "The Oil Technique for GR-S" have been published by the Ministry of Supply in conjunction with the Ministry of Aircraft Production. The researches behind these documents were carried out by I.C.I., Ltd., on behalf of the Government departments concerned. Inquiries in connection with the publications should be made either to the Ministry of Supply, Advisory Service on Plastics and Rubber (C.R.D.4b), Berkeley Court, Glentworth Street, London, N.W.1, or to Dr. W. J. S. Naunton, Hexagon House, Blackley, Manchester, 9.

A series of Chance Memorial Lectures has been instituted by the Society of Chemical Industry to commemorate the foundation and progress of glass, plastics and other chemical industries in the Midlands by the Chance family during the past 100 years. The first lecture will be given in Birmingham next month by Mr. Kenneth Chance.

The International Serum Co., Ltd., has sent us a reprint from *Nature* (1944, 153, p. 380) of a letter by H. E. Enoch and W. K. S. Wallerstiner on the subject of "A standardised antibacterial pyrogen-free metabolite preparation containing living *Penicillium notatum*." This preparation—known to the public, as a result of extravagant stories in the lay Press, by the name of "vivicillin"—is a suspension of penicillin mould in a fluid medium, freed from pyrogens and other impurities. It is suggested that its therapeutic properties are due to the presence or production not only of penicillin but of other potent bacteriostatics destroyed in the course of ordinary penicillin manufacture. Penicillin continues to be formed *in vivo*, it is claimed.

Foreign News

Sausage skins are being made from denitrated nitrocellulose, states the Hercules Powder Co. of America.

Chilean copper production in 1943 topped the 500,000-ton mark. In the last decade output has thus been trebled.

Under Lease-Lend the United States shipped nearly 100,000,000 ascorbic acid tablets last year. Total vitamin shipments amounted to 588,305 lb.

Sales of Chile saltpetre in 1942-43 amounted to 1,243,040 tons, as against 1,371,284 for 1941-42. An individual firm, the Lautaro Nitrate Co., provided 420,828 tons of nitrate, and 376,954 kg. of iodine.

Leverkusen, which has one of the largest chemical works in Europe, employing 20,000 workers, was bombed on the night of May 2 by Mosquitos, many of which carried 4000-pounders.

A new sesquiterpene alcohol, partheniol, and parthenyl cinnamate have been isolated from guayule resin. Details are given by E. D. Walter, of the Eastern Regional Research Laboratory, U.S. Department of Agriculture, in *J. Am. Chem. Soc.*, **1944**, *66*, p. 419.

Exports of chrome ore from Turkey to Germany for the years 1938—1942 were respectively 208,055, 192,842, 110,037, 81,286 and 129,307 tons. The estimated figure for 1943 was 103,000 tons, and for the first two months of this year 16,670 tons. The cessation of Turkish chrome exports was recorded in THE CHEMICAL AGE of April 29 (p. 405).

A series of chloroacetyl and aminoacetyl derivatives of sulphonamides has been prepared by Jacob Kinkelstein, of Hoffmann-La Roche, Inc., New Jersey, U.S.A., for study as chemotherapeutic agents. The methods of synthesis are described in *J. Am. Chem. Soc.*, 1944, *66*, p. 407, where it is stated that many of these drugs are very effective against pneumonia and two other types of germ.

Forthcoming Events

The North of England Institute of Mining Engineers meets on **May 13,** at 2.30 p.m., in the lecture theatre of the Institute, Newcastle, to hear a paper by Mr. H. R. Wheeler, B.Sc, on "American Methods of Coal Mining."

The Tees-side Sub-Section of the **British Association of Chemists** meets on **May 15,** at the Y.M.C.A. Rooms, Dovecote Street, Stockton, to hear a paper by Dr. W. A. Southorn on "Thixotropy and Allied Properties."

The annual meeting of the St. Helens Section of the **British Association of Chemists** will be held in the Fleece Hotel, St. Helens, at 7.30 p.m., on **May 18.**

The chemical exhibition arranged by the **Association of Scientific Workers** moves to Liverpool on **May 18.** It will be on show there, at the stores of T. J. Hughes, Ltd., until June 3.

Dr. F. G. Mann, F.R.I.C., will deliver his Tilden Lecture entitled "Some Aspects of the Organic Chemistry of Phosphorus and Arsenic" at the meeting of the **Chemical Society,** arranged for 4.30 p.m., on **May 18,** at Burlington House, Piccadilly, London, W.1.

A joint meeting of the Plastics Group and the Birmingham and Midland Section of the **Society of Chemical Industry** will be held on **May 18,** at 2.30 p.m., at the Chamber of Commerce, New Street, Birmingham, when Dr. J. Hofton will present a paper on "Amino Resins."

A paper on the "Uses of Permeable Refractories for Furnace Construction," by Mr. R. H. Anderson, Mr. D. C. Gunn, M.Sc., and Dr. A. L. Roberts, will be given to members of the **Institute of Fuel** at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 6 p.m., on **May 18.** It is intended that demonstration furnaces shall be on view at the meeting.

The Institute of the Plastics Industry, North-Western Section, is holding an annual dinner and social evening after the annual general meeting, on **May 19,** at the Engineers' Club, Albert Square, Manchester, at 6.30 p.m.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

U. D. A. (PLASTICS), LTD., Bristol. (M., 13/5/44.) April 13, mortgage and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Excelsior Works and adjoining premises at High Wycombe, also general charge.

Company News

Greeff Chemicals Holdings, Ltd., are paying a final dividend of 5 per cent. plus a bonus of 2 per cent., making 10 per cent. (same) for the year.

Babcock and Wilcox, Ltd., with a final ordinary dividend of 6 per cent. and a bonus of 1 per cent., are maintaining the 11 per cent. dividend for the year. Profit before taxation was £638,583 (£632,443).

Sternol, Ltd., report a net profit for the year of £6885 (£6552). A payment of 4 per cent. is recommended on the preferred ordinary shares, for the period July-December, 1938, making a total distribution of 8 per cent. on this class of shares during the year.

An extraordinary general meeting of **B. Laporte, Ltd.,** has been called for May 25 to consider resolutions: (a) to adopt new articles; and (b) to increase the capital to £1,000,000 by the creation of 500,000 new ordinary shares of £1, ranking *pari passu* with the existing ordinary stock.

New Companies Registered

Trylon, Ltd. (387,324).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturers of and dealers and workers in plastics, moulding powders, varnishes, lacquers, etc. Directors: C. E. Scott-Bader, Wallaston Hall, near Wellingborough, Northants; B. S. Parkyn.

Opticell, Ltd. (387,237).—Private company. Capital: £1000 in 1000 shares of £1 each. Designers and manufacturers of scientific and electronic instruments, chemicals, plastics, etc. Directors: A. J. Croise; H. H. Williams. Registered Office: 366 Newport Road, Cardiff.

Chemical and Allied Stocks and Shares

THE general undertone of stock markets has remained buoyant, with further gains recorded in British Funds and in a wide range of industrial shares. The rise in the latter reflected shortage of stock in the market, and also the improved demand that has been in evidence since the Budget induced more hopeful views in regard to post-war prospects of industry.

Imperial Chemical were again bought on yield considerations and strengthened further to 39s. 4½d., at which price the yield on last year's 8 per cent. dividend exceeds 4 per cent., still comparing favourably with the average return on leading industrials. B. Laporte were 80s., following the announcement of the proposed increase in the authorised capital to a million pounds by the creation of half-a-million new £1 ordinary shares, which it is assumed may indicate the possibility of considerable further expansion of the business as time proceeds. Turner & Newall have risen further to 84s. 6d., and Dunlop Rubber to 43s. 9d. Pinchin Johnson, under the influence of the recently-issued accounts, further improved to 36s. 9d., while Nairn & Greenwich were higher at 75s., and British Aluminium firmer at 47s. 7½d. The units of the Distillers Co. have been more active at the higher level of 92s. 9d. Elsewhere, General Refractories at 16s. were again slightly better on balance. Among shares of companies interested in plastics, De La Rue eased, but later showed a partial recovery to 173s. 9d., Erinoid 10s. shares were 11s., and British Industrial Plastics 2s. ordinary 7s. 9d. Lewis Berger were steady at 104s. xd. British Celanese eased to 28s. 3d., and Courtaulds to 53s. 3d. International Paint were maintained at 122s. 6d., and Triplex Glass better at 37s.

There were again numerous gains in iron and steel issues, which continued in larger demand. Consett Iron 6s. 8d. units improved to 8s. 4½d., Allied Ironfounders to 52s. 6d., and United Steel to 26s. 1½d. Babcock & Wilcox at 51s. 3d. responded to the higher profits and maintained distribution for the past year's working. In other directions, Associated Cement, which were under the influence of the dividend, moved up to 64s. 6d. Tunnel Cement shares also moved better at 51s., and Rugby Cement 5s. ordinary to 9s. 9d. Further improvement to 31s. 10½d. was recorded in British Plaster Board. Lever & Unilever at 35s. 6d. were the same as a week ago. Murex ordinary improved to 105s., and United Molasses 6s. 8d. units were 33s. 4½d., while Borax Consolidated deferred remained unchanged at 35s. 7½d. Awaiting the results, Pressed Steel shares rose further to 32s.

British Drug Houses were 22s. 6d., and Burt Boulton 23s., while in other directions, W. J. Bush ordinary remained firmly held and quoted at 60s. Monsanto Chemicals 5½ per cent. preference kept at 23s. 6d., and Greeff Chemicals Holdings 5s. ordinary at 7s. 3d. Amalgamated Metal ordinary were maintained at 18s., while Imperial Smelting further strengthened to 14s. 6d.

Firmness was shown in Boots Drug 5s. ordinary at 44s., and in Timothy Whites at 33s. 6d. Although best prices were not held, Sangers showed improvement on the week from 27s. to 27s. 7½d. Gas Light & Coke ordinary further improved from 20s. 6d. to 26s., and Low Temperature Carbonisation 2s. shares to 2s. 9d. Cellon 5s. ordinary were 23s. 6d., awaiting the dividend. William Blythe 3s. ordinary were 9s., and Lawes Chemical 13s. British Glues & Chemicals 4s. ordinary at 9s. have risen further in price. British Match maintained firmness at 40s. 3d. xd. In other directions, Beechams deferred were 17s. 10½d., dividend payments to-date having increased hopes that the results will show a further upward trend in profits. Leading oil shares, particularly Anglo-Iranian and Trinidad Leaseholds, moved higher in price; sentiment reflected hopes of a large measure of post-war co-operation between U.S. and British oil interests.

British Chemical Prices

Market Reports

CHEMICAL trade conditions in London during the past week have been fairly active in a number of sections, both as regards the volume of new bookings and the rate at which supplies are being taken up against contracts. Additions to order books have been reported from various sections of the market and quotations are on a firm basis throughout. In the soda products section there is a steady call for contract deliveries of both solid and liquid caustic soda, while fair quantities of soda ash and nitrate of soda are being taken up. A moderate business continues in acetate of soda and a steady demand is reported for hyposulphite of soda, both the technical and photographic grades. Among the potash compounds, outputs of home makers of permanganate are being steadily absorbed and a ready outlet is reported in respect of caustic potash and acid phosphate of potash. In the acid section there is a fair call for supplies of hydrochloric acid, and offers of oxalic acid are being readily taken up. Salicylic acid is steady and all grades of acetic acid are meeting with a good demand at controlled rates. There has been little fresh in the general position of the coal-tar products during the week and prices remain unchanged.

MANCHESTER.—The alkali products generally are meeting with a steady demand on the Manchester chemical market and a fair amount of fresh inquiry for these, as well as for the magnesia and ammonia compounds, alum, sulphate of alumina, barium carbonate, and most of the acid products has been reported here during the past week. Quotations generally maintain a very firm front, with little in the way of actual fresh movement. In the case of the by-products, the light materials, especially the toluols and benzols, are in good demand, while the creosote oils, crude and refined tar, and carbolic acid are also going steadily into consumption.

GLASGOW.—In the Scottish heavy chemical trade there is no change during the past week, home business maintaining its steady day-to-day transactions. Export trade remains very limited. Prices keep firm at previous levels.

Price Changes

Charcoal.—Lump, £15 to £16 per ton, ex works. Granulated, supplies scarce.

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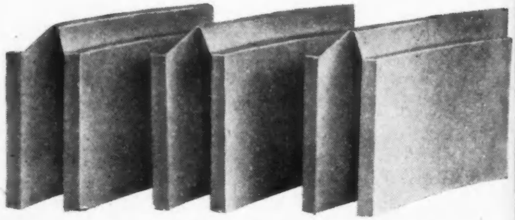

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